



RF & Microwave Circuit Design

Spring 2016

Instructor: Dr. Vahid Nayyeri (nayyeri@iust.ac.ir)

Class time:

Office hours:

Office location: Antenna and Microwave Research Lab.

Course website: <http://webpages.iust.ac.ir/nayyeri/courses/mcd/>

Prerequisite: Fields and Waves Theory (undergrad course), Microwave (undergrad course)

References:

- David Pozar, Microwave Engineering, 4th Ed., JohnWiley & Sons, 2011.
- Guillermo Gonzalez, Microwave Transistor Amplifiers: Analysis and Design, 2nd Ed., Prentice Hall, 1996.

Course Description:

This course contains three sections. The first section provides a physical and mathematical description of wave propagation in guided structures, including: microstrip lines, striplines, and coplanar waveguides. The section also provides an overview of network Theory for N-port networks. As well, the scattering parameters and analysis via flow diagrams are introduced. In the second section, passive microwave circuit devices are studied including couplers, hybrids, power dividers/combiners, narrow and wide band matching networks, and filters. In the third section solid state microwave amplifiers (and probably oscillators) are introduced.

Goals:

The objectives of this course are to provide a foundational knowledge of microwave circuit design, including:

1. an understanding of transmission lines, microstrip lines, and network theory,
2. an applied understanding of matching networks using lumped and printed circuit components,
3. the practical design of hybrids, couplers, and dividers,
4. measurement of passive microwave circuits using network analyzer,
5. practical design of microwave amplifiers, combined with matching networks and bias circuitry,



6. measurement of active microwave devices using spectrum analyzer,
7. simulation and design using CAD, specifically Agilent Advanced Design System (ADS).

Topics:

- Basic Theories:
 - ✓ Transmission Lines
 - ✓ Smith Charts and Simple Matching
 - ✓ Network Theory (Z&Y Matrices, ABCD Matrix, Scattering Matrix, Signal Flow Graphs)

----- Midterm Exam 1-----

- Microwave Passive Circuits:
 - ✓ Microwave Resonators
 - ✓ Power Dividers, Hybrids, and Coupler
 - ✓ Microwave Filters
 - ✓ Microwave Measurement: Network Analyzer (Lab)

----- Midterm Exam 2-----

- Microwave Active Circuits:
 - ✓ Microwave Amplifier Design

----- Final Exam-----

Grading System (might be changed during the term):

- Midterm and Final Exams: 60% (3×20%)
- Homework Assignments 15%
- Projects: 25%

Very Important Notes:

- Students are responsible for all material in the reading assignments even if not covered in the Lectures. This material may be questioned not only on assignments but also on exams.
- Homework assignments and final projects will involve computer simulation using the Agilent Advanced Design System (ADS). Students need to have access to 2011 version of ADS. Students will be provided with ADS tutorials, however, they are responsible for self-learning.